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Research Briefs

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Nutrition and Health

Cows may hold the key to a measure of relief for some AIDS patients. Certain AIDS patients have been found to be infected with a one-cell internal parasite, *Cryptosporidium*, that also infects animals. The parasite--found in contaminated food or water--causes severe diarrhea in humans. It does not produce AIDS in animals or humans. Scientists have obtained a chemical called transfer factor from the lymph nodes of parasite-infected cows. When weekly oral doses were given to AIDS patients at New York University Medical School, 75 percent of them stopped having diarrhea. In most cases, by the third week, the treatment produced an immune response to the parasite in the patient's body. Patients had no ill effects. Scientists think the product somehow reactivates immunity-producing cells that have been "turned off" by AIDS. Oddly, transfer factor doesn't give newborn calves much protection against *Cryptosporidium*, since a mature immune system is needed for the material to be effective.

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Mother's milk can help very premature infants get a head start. And scientists are close to overcoming the biggest hurdle--getting enough calcium and phosphorus

in the breast milk in a form the infants can absorb. A shortage of these minerals could slow growth, impair healing of chronic lung diseases, and lead to bone malformations. They want to tube-feed mother's milk rather than commercial formula from birth because breast milk contains immune factors that can help these highly susceptible preemies fight infections. It's also more digestible. But like commercial formula, it has to be fortified with the extra protein, calories and minerals that very low-birth-weight infants need for normal growth and development. So far, these infants have absorbed more calcium and phosphorus from the breast-milk formula than from the two commercial products for preemies tested. (There are only five such products on the market.)

Children's Nutrition Research Center, Houston, TX
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Very premature infants who are breastfed after leaving the hospital are likely to have a lower bone mineral content than those who get a commercial formula, a study shows. But the researchers believe this risk does not outweigh the benefits of breastfeeding. In a year-long followup of infants born 10 to 13 weeks before term, those fed mother's milk after being released from the hospital had a significantly slower rate of bone mineralization than those fed a cow-milk-based formula. The findings suggest that mother's milk may need to be fortified with extra minerals for a longer period. There was no difference in body weight or length or head circumference between the two groups, indicating that the preemies grow equally well on breast milk or formula. Pediatricians should periodically check the mineral status of breastfed preemies through standard lab tests.

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Can megadoses of vitamin E recharge the immune system of older people? Preliminary results of a study of 34 men and women over age 60 indicate yes. Compared to those who got a placebo, the volunteers who took huge daily doses of vitamin E for 30 days showed a significant improvement in two measurements of immune response analyzed so far. If test results continue to be positive, it could mean better protection against infections for older Americans who are most sus-

ceptible. The daily dose of vitamin E in this study was 800 international units. That's 53 and 67 times the Recommended Dietary Allowance for men and women, respectively. Further research is needed to tell if a lower dose might be as effective.

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It takes more than copper deficiency to provoke symptoms of heart disease and cause sudden death of animals who don't get the mineral in their feed. Seven years of studies point to a three-way interaction: the dire consequences of copper deficiency occur only to male animals and only when their feed contains substantial amounts of fructose. (Fructose accounts for half the sugar in table sugar and in high-fructose corn sweeteners.) Male animals on such a diet accumulate at least twice as much sorbitol--an alcohol byproduct of sugar metabolism--in their tissues as do females or males who get starch instead of fructose. Sorbitol has the ability to bind copper, potentially making the animals even more deficient. Why male animals accumulate sorbitol and females don't is not known. The alcohol is known to accumulate in certain tissues of diabetics--even those who use insulin to control blood sugar levels--causing inevitable damage to eyes, nerves and kidneys. The findings indicate an urgent need to answer the many unknowns about how the human body metabolizes carbohydrates, particularly fructose.

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To protect their infants, pregnant and nursing women may want to go easy on sodas and processed foods containing high-fructose corn sweeteners or table sugar (sucrose), which is half fructose. It's well established that this sugar aggravates copper deficiency in male animals. Recent studies with pregnant and lactating rats show that a very high fructose intake can cause deficiency in developing pups even when their mothers' copper intake is adequate. Such a diet, containing 62 percent fructose--about 5 times the level in a typical American diet--reduced the copper in mothers' milk by 33 percent compared to a diet containing starch instead of fructose. The pups of mothers on the high-fructose diet averaged 50 percent less copper in the liver, the organ that stores copper and regulates circulating levels. And male pups had only half as much copper in their livers as female pups. If the mothers' diets were also copper-deficient, none of the pups survived. The findings with rats suggest that more research is needed on the interaction between fructose and copper and its potential impact on pregnant and nursing women.

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Body fat can be estimated in black Americans using the same equations developed from studies of white populations, a study shows, even though blacks carry their fat somewhat differently. The difference, however, may explain why blacks are at higher risk for diabetes and heart disease. Contrary to our earlier report, comparisons of 179 black and white volunteers with two of the most common methods for estimating body fat--skinfold thickness and bioelectrical impedance--show there is no need to factor race into the equations for estimating body fat. Skinfold measurements also showed: blacks carried more of their external fat above the waist, and black women had more fat on their backs and less on their upper arms and thighs than white women. It is well established that people who deposit fat in their upper trunk are at higher risk for developing diabetes, high blood pressure and atherosclerosis than those who deposit fat in their hips and thighs.

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A low-fat diet won't necessarily lower cholesterol in women before menopause. A study by National Cancer Institute and ARS scientists indicates that healthy, pre-menopausal women with low cholesterol levels may not reduce their chance of heart disease by replacing dietary fat with carbohydrates. But they might benefit from replacing saturated fat with unsaturated fat. In the study, women between 20 and 40 years of age had an insignificant drop in total cholesterol after eating a low-fat diet (20 percent fat) for four months. (They had very low cholesterol to begin with.) In fact, because of the extra carbohydrates in the low-fat diet, their blood triglycerides went up an average 32 percent compared to levels during the high-fat (40 percent) portion of the study. However, the type of fat in the low-fat diet made a difference in the type of cholesterol that was reduced. Women who got equal amounts of saturated and polyunsaturated fat lost the "bad" LDL cholesterol. Those who got three times more saturated than polyunsaturated fat lost significantly more "good" HDL cholesterol and had a greater rise in triglycerides.

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Being obese does not necessarily increase the risk of iron deficiency, according to studies with mice. The findings suggest that obese people who eat a well-balanced diet don't need iron supplements. Genetically

obese mice absorbed and retained about twice as much iron from test meals as their lean littermates. However, the mineral was distributed differently in the obese animals: iron levels were higher in blood and fat pads and lower in muscle and bone compared with the lean animals. The extra iron absorbed by the obese animals was apparently used to make hemoglobin for their larger volume of blood.

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Tomorrow's Foods and Fibers

Tired of ironing cotton clothes? Agency scientists have developed new technology to make cotton fabrics as wrinkle resistant as permanent press blend fabrics. The researchers are patenting a group of chemicals that produce permanent press, 100-percent cotton fabrics that dry smooth even after 65 washings. And there are other advantages: the fabrics are about 20 percent stronger than current ones; creases can be taken out or put in with a hot iron (difficult with current materials), and the new fabrics don't contain formaldehyde, which can irritate the skin and eyes. It will take several years, however, before consumers find these items on clothing store racks. That's because the chemicals are not available commercially at cost-effective prices. But companies are working to do this, and several textile mills are interested in the new process.

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A large, firm, high-quality peach that ripens uniformly is being released by researchers. The new peach can be mechanically harvested and does not discolor when exposed to air, which makes it desirable for home canning. Appropriately named Bounty, it is very productive, particularly in areas with dry soil like eastern Texas, and scores "excellent" in taste tests. Researchers recommend planting as a midseason, fresh-market peach in the south central, mid-Atlantic, and eastern U.S. Trees, which will be available through commercial nurseries in 1989, should bear fruit about four years after propagation.

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Do you long for a TV dinner with tastier meat than the standard fare? If so, a team of agency "WOF Busters" may have found the answer. WOF, for warmed-over flavor, occurs when oxygen breaks down

fats vital to fresh meaty taste. Sometimes termed "cardboardy" or "painty," WOF can develop when uncured meats are reheated. This includes the pre-cooked, frozen meat in TV dinners, as well as that familiar leftover, the family meatloaf. But in lab studies, scientists found that adding just two-hundredths of an ounce of certain proteins to two pounds of ground beef blocked the warmed-over flavor for up to five days. They made this additive by chemically treating chitin, a substance common in shells of lobsters, crabs and other shellfish. These chitin substances bond to iron, preventing it from speeding up fat breakdown. Scientists say there is commercial interest in their process which may work in other meats, poultry and fish.

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All neutrophils are not created equal. Researchers have discovered these white blood cells that engulf and kill foreign intruders come in four types--at least in cows. The finding, the first of its kind in any animal, could lead to the breeding of more disease-resistant cattle. It may also explain long-noted differences in the ability of these white blood cells to move to an infection site and kill invading bacteria. To separate the four types of neutrophils, scientists tested cow blood samples with custom-designed proteins called monoclonal antibodies. These antibodies are like guided missiles and "home in" on only the targets they are programmed for. The antibody test could be used to identify cows with active neutrophils; those cows in turn become the parents of more disease-resistant breeds.

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Low-fat lamb can be produced by feeding ram lambs a high forage diet. A 5-year ARS study shows that marketing lamb meat from young rams, rather than from castrated rams (called wethers), could benefit consumers and farmers. Most lamb meat comes from wethers, which are tender but high in total fat and saturated fat. However, young rams fed a test diet of mostly alfalfa forage were 54 percent leaner than wethers. The rams produced rib-eye chops with 22 percent less total fat and nearly double the polyunsaturated-to-saturated fat ratio than wethers on the same diet. The ram meat is not yet as tender as that from wethers, but current research may solve that problem soon. The farmer could benefit too, because forage-fed rams grow about 15 percent faster and use feed about 15 percent more efficiently than wethers.

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Food Freshness and Safety

Helpful worms known as beneficial nematodes can be dried out, stored, shipped to where they're needed, then reactivated by adding water. It's a new technique developed by an ARS scientist and colleagues at Biosys, a California biotechnology company. Nearly invisible, beneficial nematodes are harmless to humans, pets, birds and plants but are natural enemies of home, garden and farm pests. Until now, the expense and problems of storing and shipping them has prevented their wider use as a biological control. Also, they must be mass-reared to get enough of them to be effective. With the new technique, large numbers can be dried by osmotic desiccation, a natural process in which water in the worms is pulled out.

*Commodity Protection and Quarantine Insect Research
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A nematode variety named "kapow" has proven to be a powerful natural enemy of the Mediterranean, melon and oriental fruit flies. These fruit fly species thrive in the Hawaiian Islands and pose a continuing threat to mainland agriculture. Several extremely costly eradication programs have been carried out in Southern California to eliminate hitch-hiking fruit flies. In recent experiments in Hawaii, the microscopic, almost invisible nematodes killed from 89 to 97 percent of the fly larvae. *Steinernema feltiae* nematodes of the kapow variety move faster than other nematodes in pushing their way through natural openings in larvae to kill them with a special bacterium. These beneficial nematodes are harmless to people, plants, pets and birds.

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Pesticides and antibiotics can now be monitored in meat and meat byproducts without harmful chemical solvents. The technology, refined by ARS scientists, relies on heated and pressurized gases such as carbon dioxide to extract chemical residues from meat products. Gas, compressed and made to act as a fluid, flows through the meat to dissolve fat and chemicals in the fat. This separates fat from the meat product. The food industry has used the technology for several years to decaffeinate coffee, extract hops for flavoring beer and perform other food-processing tasks. Removing pesticides with supercritical extraction could minimize the use of chemical solvents in research and eliminate the problem of disposing of solvent wastes.

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Cheesemakers can use a new chemical test to see if their cheeses are properly aged and ready to sell. No routine scientific measure had been suitable for cheeses that develop their characteristic flavor, texture and aroma during ripening. But the new test reveals the breakdown of casein, a milk protein, into small fragments--a normal change that properly cured cheeses undergo as they age. The amount of casein breakdown that has occurred is measured by a purple color that changes in intensity as cheese ages. Commercial dairies could automate the procedure and use it to check such cheeses as cheddar, feta, Monterey Jack, Teleme and Gouda.

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Farmers may soon be able to apply herbicide and fertilizer with a single "pill." Using existing technology that encapsulates the herbicide chemicals in starch, researchers have now enclosed both a herbicide and a fertilizer inside a single layer of starch. Esters of 2,4-D--widely used for weed control--were mixed with gelatinized starch and wrapped around pellets of urea fertilizer. Tests using the experimental product show it reduces the evaporation of herbicide chemicals and may cut back on the number of applications of chemicals farmers need to apply to their fields. This would increase safety for farmers and others handling the chemicals.

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Improving the quality of the 3.6-billion-pound U.S. peanut crop may be possible with new tests that agency scientists are evaluating for possible use in the federal peanut grading system. The tests could help inspectors remove from the food chain peanuts contaminated with aflatoxin, which is produced by certain fungi. Peanut inspectors now visually examine peanut samples for the presence of the toxin-producing fungi, which can infect drought-stressed peanuts and make them unsafe to eat. The new tests measure aflatoxin directly, letting inspectors know whether aflatoxin levels exceed acceptable limits. In lab studies, one of the new tests was 96 percent accurate, compared to 53 percent for visual inspection.

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